

II. REMARKS

A. Introduction

Applicants submit this Response in a bona fide attempt to (i) advance the prosecution of this case, (ii) answer each and every ground of objection and rejection as set forth by the Examiner, (iii) place the claims in a condition for allowance, and (iv) place the case in better condition for consideration on appeal. Applicants respectfully request reexamination and reconsideration of the above referenced patent application in view of this Response.

As indicated above, Claims 10 and 14 - 25 have been amended and Claims 1 - 9 and 26 - 30 have been deleted. The Specification has also been amended to clarify the terms and relationships employed by Applicants.

Applicants respectfully submit that the noted amendments merely make explicit that which was (and is) disclosed and/or implicit in the original disclosure. The amendments thus add nothing that would not be reasonably apparent to a person of ordinary skill in the art to which the invention pertains.

Applicants further submit that the noted amendments are not made in view of any prior art reference.

B. Response to Objections

The Examiner has again objected to the Specification under 35 U.S.C. § 112, first paragraph, "as not written in such clear and exact terms to enable any routineer in the art to practice the invention in its best mode." The Examiner contends, *inter alia*,

As it was indicated in the previous Office actions, the expression "absorption spectrum having a reference energy" is not proper. How can the spectrum have absorption energy? By definition (Merriam-Webster On-line Dictionary), "electromagnetic spectrum is the entire range of wavelengths or frequencies of electromagnetic radiation extending from gamma rays to the longest radio waves and including visible light." Each wavelength or frequency corresponds to specific absorption energy. Therefore, the expression "absorption spectrum having a reference energy" does not have any sense, since the spectrum itself is a continuum of variable energies.

It is further unclear, how IR spectrum of the impurity alone can be measured, when the impurity is unknown and therefore is not available in a pure state.

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The Examiner would like to emphasize again that the absorption energy of molecules (not the spectrum!) and intensity (or power) of light are not synonyms; they are defined clearly and unambiguously in the art, see e.g. "Fundamentals of Spectrophotometry" in "Quantitative Chemical Analysis" by Harris. It is well known to any routineer in the art that absorption energies define the origin of the molecule, specifically IR absorption energies define vibration states of the molecular functional groups, and have nothing to do with the concentration of the compound; at the same time intensities of the absorption lines (or changes in the light power, or transmittance) define the concentration of the compound. It is completely unclear, how dividing a frequency of one compound over the frequency of the other compound allows determining the concentration of the first one in the second? Even less it is clear, how the concentration of one compound in another compound can be determined from the spectra of two pure compounds, with 100% concentration of each of them?

Further, chemical compounds, i.e., contaminates or impurities, cannot be defined by their vibration energies (not mentioning incorrectness of such terminology) (page 6). Vibration energies are associated with specific bonds (e.g. C=O, or C-C, or C=C bonds), which can belong to numerous compounds. It is not clear, how any routineer in the art can determine, which compounds are considered impurities in the instant method by defining vibration energies of their bonds. It is only possible to determine, which bonds are present in the molecules. Such description doest not give a clear and apparent description of the potential contaminants and is inappropriate for the disclosure, which, as it has already been stated lacks clarity in general.

As previously stated, Applicants respectfully submit the terms and phrases employed in the original specification are well known in the art. The terms and empirical relationships based thereon would thus be readily apparent to one having ordinary skill in the art.

Notwithstanding Applicants' well grounded position, to address the Examiner's Section 112 objections, Applicants have amended the specification to explicitly state what was (and is) implicit in the original terms and relationships. Applicants accordingly respectfully request that the Section 112 objections relating to the specification be withdrawn.

C. Response to Rejections

1. 35 U.S.C. § 112

The Examiner has rejected Claims 10 - 25 and 30 under 35 U.S.C. § 112, first paragraph, "as failing to comply with the enablement requirement." The Examiner contends that "[t]he claim(s) contain subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is not nearly connected, to make and/or use the invention.

The Examiner asserts, *inter alia*,

As it was indicated above, absorption spectrum cannot be associated with a reference absorption energy, since by definition, "electromagnetic spectrum is the *entire range* of wavelengths or frequencies of electromagnetic radiation extending from gamma rays to the longest radio waves and including visible light", with each wavelength or frequency corresponding to specific absorption energy. Thus, the terminology of the claims contradicts the only possible and accepted terminology and makes the nature of the invention unclear.

Claims 10 and 18 recite a method for identifying impurities, and at the same time recite a step for measuring absorption spectrum of the "pure" impurity. If it is possible to measure the absorption spectrum of the "pure" impurity, then why should it be identified?

The first and third steps of the method recite measuring the absorption spectrum of the cryogenic liquid and a cryogenic liquid sample. What is the difference between these two? If this is the same cryogenic liquid, then the absorption spectra will be the same, and the first cannot be used as a reference spectrum.

The mathematical expression relating the concentration of the impurity to the logarithm of the ratio of two "reference absorption energies" is the least clear part of the disclosure. The examiner does not recall any reference on IR spectroscopy with such relation. Corresponding reference is required.

Claims 16, 24 and 30 recite compounds defined by their vibration frequencies in nm. As is indicated above, vibration energies are associated with specific bonds (e.g. C=O, or C-C, or C=C bonds), which can belong to numerous compounds. It is not clear, how any routineer in the art can determine, which compounds are considered impurities in the instant method by defining vibration energies of their bonds. It is only possible to determine, which

bonds are present in the molecules. Such description does not give clear and apparent description of the potential contaminants and is inappropriate for the disclosure, which, as it has already been stated lacks clarity in general.

The Examiner has also rejected Claims 10 - 25 and 30 under 35 U.S.C. § 112, second paragraph, "as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention." The Examiner contends:

It is already indicated that the expression "absorption spectra corresponding to reference energy", recited in claims 10 and 18 is technically incorrect and does not have any sense.

It is further unclear, which cryogenic liquid is meant in the first and the third steps of the method. If this is the same cryogenic liquid, then how it can be used as a reference in the first step, and as an analyte in the third step?

In the second step, the impurity alone (i.e. pure "impurity") is being measured. If the impurity is not known (i.e. is not identified), how is it possible to perform this step?

It is not apparent, what the whole phrase "confirming the presence of said cryogenic liquid sample absorption spectrum associated with said impurity" might mean. Why should be the presence of the absorption spectrum of the cryogenic liquid confirmed? If the absorption spectrum is measured, then its presence does not need to be confirmed – otherwise it was not measured. The expression is very confusing.

The mathematical expression in claims 10 and 18 is so unclear, that the examiner requests any reference, which provides such expression for calculating concentrations of the compounds from IR spectra.

The terminology used by the Applicants in the specification and claims completely contradicts accepted terminology in the art and makes the disclosure unclear, indefinite, and confusing.

Claims 16, 24 and 30 recite "a material having a vibration energy in the range of approximately 1000 nm to 250 nm". First, this is not a correct technical definition. The material can comprise molecules having bonds with vibration energies of the range recited in the claims. Second, chemical compounds, i.e. contaminates or impurities, cannot be defined by their vibration energies. Vibration energies are associated with specific bonds

(e.g. C=O, or C-C, or C=C bonds), which can belong to numerous compounds. It is not clear, how any routineer in the art can determine, which compounds are considered impurities in the instant method by defining vibration energies of their bonds. It is only possible to determine, which bonds are present in the molecules. Such description does not give a clear and apparent description of the potential contaminants and is inappropriate for a disclosure, which, as it has already been stated lacks clarity in general.

Applicants again respectfully submit that the Examiner's rejection of Claims 10 - 25 and 30 is contrary to well established law. Indeed, *In re Marzocchi & Horton*, 169 U.S.P.Q. 367 (C.C.P.A. 1971) unequivocally mandates that the Examiner *must* accept Applicants' disclosure as being objectively enabled.

The only relevant concern of the Patent Office under these circumstances should be over the truth over any such assertion. The first paragraph of § 112 requires nothing more than objective enablement. How such a teaching is set forth, either by the use of illustrative examples or by broad terminology, is of no importance.

As a matter of Patent Office practice, then, a specification disclosure which contains a teaching of the manner and process of making and use the invention in terms which correspond in scope to those used in describing and defining the subject matter sought to be patented must be taken as in compliance with the enabling requirement of the first paragraph of § 112 unless there is reason to doubt the objective truth of the statements contained therein which must be relied on for enabling support. 169 U.S.P.Q. at 369.

As stated above, Applicants respectfully submit that the terms, phrases and empirical relationships employed in the claims (and specification) are well known in the art. The noted terms would thus clearly enable any person skilled in the art to make and use Applicants' invention.

Notwithstanding Applicants' well grounded position, Applicants have amended Claims 10 and 14 - 25 to explicitly state what was (and is) implicit in the terms, phrases and empirical relationships set forth in the original disclosure. By way of example, in Claims 10 and 18, the phrase "cryogenic liquid absorption spectrum corresponding to a first reference energy" has been amended to read "first energy spectrum comprising a plurality of wavelengths, said first plurality of wavelengths corresponding to a first reference...". In Claims 16 and 24, the phrase "material

having a vibration energy" has been amended to read" material having molecules that exhibit a vibration energy."

As set forth above, the specification has also been amended to correspond to the claims. Applicants therefore respectfully request that the rejection of Claims 10 - 25¹ under 35 U.S.C. § 112 be withdrawn.

2. 35 U.S.C. § 102

Although the Examiner has indicated that the "rejections of the claims over the prior art are moot in view of the amendment," the Examiner contends:

...the invention, if disclosed using the proper terminology, is completely covered by Moulson's reference, which specifically and unambiguously discloses a method for on-line (in-situ) NIR (near infrared) detection of the impurities in cryogenic liquids in a flow cell. The fact, that for the specific experiment on-line flow-cell was used for off-line analysis for the purpose of initial conducting the experiments in a simpler environment, does not change the anticipatory character of Moulson's reference and does not make it un-enabling, contrary to the Applicant's arguments.

Applicants respectfully submit that Moulson does not anticipate the present invention. It is well established that a rejection for anticipation under Section 102 requires that each and every limitation of the claimed invention be disclosed in a single prior art reference. See *In re Paulsen*, 30 F.3d 1475, 1478-79, 31 U.S.P.Q. 2d 1671, 1673 (Fed. Cir. 1994); *Scripps Clinic & Research Foundation v. Genentech, Inc.*, 927 F.2d 1565, 18 U.S.P.Q. 2d 1001 (Fed. Cir. 1991). See also *American Permahedge, Inc. v. Barcana, Inc.*, 857 F. Supp. 308, 32 U.S.P.Q. 2d 1801, 1807-08 (S.D. NY 1994) ("Prior art anticipates an invention ... if a single prior art reference contains each and every element of the patent at issue, operating in the same fashion to perform the identical function as the patent product. ... Thus, any degree of physical difference between the patented product and the prior art, *no matter how slight*, defeats the claim of anticipation."); *Transco Ex parte Levy*, 17 U.S.P.Q. 2d 1461, 1462 (Bd. Pat. App. & Int'l 1990) ("[I]t is incumbent upon the examiner to identify wherein each and every facet of the claimed invention is disclosed in the applied reference".)

¹ As indicated above, Claim 30 has been deleted.

As previously submitted and set forth in further detail hereinbelow, Moulson does not identically disclose each and every recited element of the claims in question. Accordingly, Moulson does not anticipate such claims in accordance with 35 U.S.C. § 102.

As now set forth in the claims in question, Applicants' invention is directed to a method for identifying and quantifying impurities in a cryogenic liquid by employing light in the *near infrared region* (i.e., near infrared spectroscopy) to measure various absorption spectra. Moulson differs from Applicants' claimed invention in that it solely discloses liquid phase *infrared spectroscopy* as a technique for monitoring dopant and impurity concentrations in liquid argon. Indeed, Moulson neither discloses, nor even suggests using near infrared spectroscopy in the manner claimed by Applicants. Accordingly, Moulson does not anticipate the claim invention.

Further, Moulson is directed to sampling and analyzing impurities in an *on-line* fashion. Notwithstanding the Examiner's assertions pertaining to the alleged in-situ disclosure of Moulson, Applicants respectfully submit that such disclosure is non-enabling and thus does not anticipate the claims in question.

"A Bruker IFS-66 FT-IR spectrometer with a spectral resolution of 0.25 cm⁻¹ was used to collect the spectra. The IR beam was obtained from a medium-infrared Globar source and received by an external, liquid nitrogen-cooled-mercury-cadmium-telluride detector. Spectra were collected and analyzed using OPUS/IR version 1.2 software [6].

Samples were analyzed in a cryogenic cell with volume of 1.00 l. The cell was originally designed to be combined with a detector used to study the ionization characteristics and electron mobilities of doped liquid argon solutions [7], so that IR analysis of the solutions could be performed in situ. For the present studies, however, the cell was detached from the detector, surrounded by 25 layers of aluminized Mylar and mounted inside a vacuum cryostat of its own." (emphasis added)

As is evident from the above passage, Moulson does not enable one skilled in the art to utilize the detection system in an on-line fashion. "To constitute an anticipatory reference, the prior art must contain an enabling disclosure". *Chester v. Miller*, 906 F.2d at 1576 n2, 15 U.S.P.Q. 2d at 1336n.2 (Fed. Cir. 1990). Since Moulson does not provide an enabling disclosure, it cannot be considered an anticipatory reference for the purposes of 35 U.S.C. § 102.

III. CONCLUSION

Applicants having answered each and every ground of objection and rejection as set forth by the Examiner and having added no new matter, now submit that all claims in the above-referenced patent application are in condition for allowance and the same is respectfully solicited.

If the Examiner has any further questions or comments, Applicants invite the Examiner to contact the Attorney of record at the telephone number below to expedite prosecution of the application.

Respectfully submitted,

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